A precocious molecular procedure for sexing tilapia

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Key words: gene, sex, all-male, sex-differentiation, brain, YY

Due to tilapias great farming attributes, they are presently the world's second most farmed fish after carps. Nevertheless, tilapias precocious sexual maturation, continuous reproduction and mouth-brooding parental care of females are serious drawbacks. Sex control is needed in tilapia farming to overcome these constraints and ensure high yields. Thus farming relies on the production of all-male populations, taking advantage of the fast-growth rate of males. Sex determination is complex in tilapia, governed by sex chromosomes, minor parental factors and temperature. The lack of sex-linked markers in tilapia and the fact that there is currently no reliable sexing-procedure before three months of age, slows the finding and implementation of new all-male technologies that are not hormonal but environmentally-friendly. Currently all-male populations are mostly produced by sex-inversion using androgen treatments. The YY male technology could be a solution but it is long and tedious, requiring numerous progeny testings and sex-ratio analysis, which are fundamental to avoid undesired sex-ratios associated to the presence of minor genetic factors. In this study we describe a precocious sexing procedure for tilapia which could be used for facilitating and accelerating the identification of specific genotypes of interest (YY males or XY females) with lower production costs. We have found a gene (M-gene) which is strongly expressed in the heads of male tilapia larvae. A procedure was developed in which M-gene expression was analysed on individual fish using a simple PCR analysis or the more sophisticated quantitative real-time PCR. The M-gene was first analysed in individual heads and trunks of all-male XY and compared to all-female XX larvae, from 10 to 17 days post-fertilisation (dpf). RT-PCR revealed a clear unique PCR product in males' head that was absent or low in females. The highest male M-gene expression was revealed at 14 dpf. Elevated expression was likewise obtained when using real-time PCR. This analysis was then tested using several distinct progenies having different sex-ratios from 0 to 100% males. M-gene expression at 14 dpf was perfectly correlated with the sex ratios of these

progenies analysed later at 3-4 months of age. Blind tests performed in 10 groups showed that male M-gene expression is a good precocious sexing procedure for tilapia. This sexing procedure will strongly facilitate and speed up the process of YY male production since sex-ratios can be performed as early as 14 dpf without having to grow progenies until sexual maturity.

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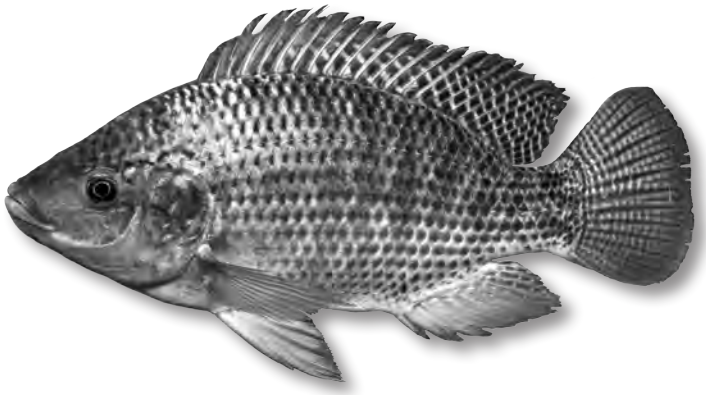

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